MEDICAL FIELD SERVICE SCHOOL
BROOKE ARMY MEDICAL CENTER

Fort Sam Houston, Texas

*FINAL REPORT

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FINAL REPORT

Title Page

Project Number:	6-59-12-022, "Treatment Procedures of Low Velocity Fragmentary Wounds"
Name & Address of Reporting Installation:	Department of Medicine and Surgery, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas
Name of Department and Branch:	Applied Science Laboratory Section, Basic Science Branch, Department of Medicine and Surgery
Period Covered by Report:	1 July 1960 - 30 June 1961

Professional Authors of the Report:

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ABSTRACT

Project Number: 6-59-12-022	Title: "Treatment Procedures of Low Velocity Fragmentary Wounds"
Name & Address of the Reporting Installation:	Department of Medicine and Surgery, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas
Period Covered by Report:	1 July 1960 - 30 June 1961
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In the event of thermonuclear warfare it is anticipated that there will be large numbers of low velocity missile wounds of the soft tissue structures. The current treatment procedure for this type wound will not be applicable due to many factors, most important of which will be the lack of qualified medical personnel. The aim of this project was to gather sufficient data that might have been used to establish minimal treatment requirements which could be followed, at a later date, by definitive treatment and still yield a well healed wound. To attain this end a pilot study was initiated and completed utilizing 20 dogs as the experimental animal. The Ivalon Sponge Biopsy Technique was used in this study and was found unsatisfactory for reasons explained in this report.

BODY OF REPORT

Project Number: 6-59-12-022 Title: Treatment Procedures of Low Velocity Fragmentary Wounds

DESCRIPTION

In the event of thermonuclear warfare it is anticipated that there will be large numbers of low velocity missile wounds in nonvital soft tissue areas. Efficient treatment of these wounds pose many problems, for there will be a shortage of medical personnel qualified to carry out any definitive action as well as a deficiency of supplies and equipment to maintain these casualties. Therefore, it would be desirable to establish some minimal requirements for the initial treatment, to be followed at a later date by more definitive treatment, and still achieve efficient healing of the wound.

The purpose of this investigation was to examine the procedures that constitute efficient treatment so that an assessment of their true value could be made. Of all the individual procedures employed to yield an efficiently healed wound, debridement receives the greatest attention. There is, however, a possibility that this time-consuming procedure is not of absolute necessity in the initial treatment of soft tissue low velocity wounds. The primary objective of this study was to gain data relative to the evaluation of limited debridement in the initial treatment phase of soft tissue wounds.

PROGRESS

The experimental animals used in this problem were healthy mongrel dogs. These animals were maintained on a standard diet for a stabilization period prior to being wounded. The animal was anesthetized with sodium pentobarbital given intravenously. All wounding and implanting procedures were carried out under nonsterile conditions, and sponge samples were removed using a local anesthetic such as procaine.

This investigation was a comparative evaluation of thorough debridement as opposed to simple incision and drainage. A comparison was made of three separate wounds inflicted upon the animals: (1) a high velocity (1500 ft/sec) wound of the "ham string" muscle group of the right rear extremity; (2) a low velocity (500 ft/sec) wound of the left rear extremity in the same general area; and (3) a standard wound of the left lower extremity produced by making an incision through the skin to the deep muscle fascia. All missile wounds were produced by fragment simulators developed by the Watertown Arsenal, Watertown, Massachusetts.

A total of 20 animals were expended in completing this initial phase. These animals were divided into two separate groups of ten each. In one group the wound received a thorough debridement, and in the second group the wound was simply incised and a drain established. The standard wound served as a control in both experimental groups. In this way the utilization of two experimental groups allowed comparisons to be made of the rate of wound healing between debrided and incised wounds, for both high and low velocity missile wounds.

The rate of wound healing was assayed by the Ivalon Sponge Biopsy Technique. Four 1 cm. squares of Ivalon sponge were embedded around each missile tract and under the skin of the standard wound. These sponges were removed at three day intervals and examined histologically for the presence of collagen and mucopolysaccharide. For reasons discussed later this technique was found unsatisfactory, and as a result no data was realized. However, clinical observations of temperatures, weight, eating habits, and general clinical conditions were utilized as an index of the animal's condition.

The original plan of previous investigators working on this problem was to utilized the Ivalon Sponge Biopsy Technique as an index of wound healing. This was abandoned subsequent to recovery of the Ivalon sponges from all the experimental animals under study. It was impossible to section any of the sponges with a standard microtome because of fragmentation by the cutting blade. This was true of sponges which had been implanted in the animals as well as those which had been subjected only to fixatives. It is believed that the sponges are somehow unduly hardened by the fixing agent, although the manufacturer's recommendations were strictly adhered to.

It is further believed that erroneous information would have resulted from the use of this technique. Each sponge was embedded in a separate small incision approximately one-fourth inch from the wound. Healing, as recorded by the sponge, would reflect healing of this small stab wound and not that of the missile wound. Each of these small stab wounds revealed pus formation when the sponge was retrieved. A section of this

sponge would reveal only a collection of inflammatory cells. For these reasons the sponge biopsy was abandoned, and clinical evaluation was substituted.

Each dog wounded was examined closely for three weeks following the initial surgery. Weight, temperature, eating habits, appearance of the wound, and morbidity were the parameters observed in attempting to evaluate the animal's clinical progress. It was found that the animals in both groups lost a few kilograms of weight in the immediate post-operative period. This weight was regained in all instances by the end of the third week. This may be attributed to the failure of the dog to eat, and also to the loss of a significant amount of tissue by wounding as well as subsequent surgery. Rectal temperatures rose in all the animals from two to four degrees above normal on the first postoperative day, and in all cases the temperatures returned to normal after the second day, remaining there during the three week postoperative period. Eating habits did not differ between the two groups. The animals were anorectic only on the operative day, and began eating well on the first postoperative day. In all cases a complete lack of wound infection was evidenced. All wounds were completely clean although a few cases revealed minimal amounts of serosanguineous discharge persisting from three to five days in the postoperative period. Infection appeared in all the stab wounds used for the insertion of the Ivalon sponges as evidenced by the pus formation. All the animals appeared clinically ill after the surgical procedure. Each animal appeared alert on the first postoperative day, standing and moving about with very little difficulty in spite of the extensive damage to thigh muscle groups.

Healing seemed to progress equally between the two groups studied during the two to three week periods, and in no cases were there any after effects. After a month it was difficult in many cases to note the location of the previous wounds. There was minimum scarring with little deep fibrosis which could be palpated.

It should be emphasized that in every case the dog performed meticulous personal hygiene. Each animal kept his wounds remarkably clean with intermittant licking, and perhaps the dog's tongue actually performs a simple debridement. No nonviable or necrotic tissue was observed in any of the wounds after the operations, thus indicating this to be valid. For this reason it appears impossible to transpose results from animal experimentation specifically as performed in this study to humans.

SUMMARY AND CONCLUSIONS

A study was performed utilizing the mongrel dog as the experimental animal. Twenty dogs were separated into two groups of ten each. Each group was wounded with high and low velocity missiles. In one group the treatment consisted of simple incision and drainage, and the other group received treatment by standard debridement.

It was found that healing progressed satisfactorily in both groups with comparatively little difference. A possible mechanism for this observation is included in this report.